

REMARKS

In this office action the Examiner objected to the drawings as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: page 6 line 32, reference character "17". The Examiner required a proposed drawing correction or corrected drawings in reply to the Office action to avoid abandonment of the application.

The Examiner also objected to the drawings as failing to comply with 37 CFR 1.84(p)(4) because reference character "17" has been used to designate both water jet page 6 line 32 and mounting assembly page 7 line 22. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application.

Applicant has amended the specification on page 6, line 32 and the reference character "17" which appeared in this line was a typographical error and has been replaced with the reference figure "7". Since this should correct both of the objections that were raised with respect to the drawings, Applicant respectfully requests that the Examiner withdraw the objection to the drawings.

The Examiner also indicated that the title of the invention is not descriptive and required a new title that is clearly indicative of the invention to which the claims are directed.

The Examiner suggested the following title: ROCK BORING DEVICE WITH AN OSCILLATING AND NUTATING ROTARY DISC CUTTER.

Applicant has changed the title to that suggested by the Examiner.

The Examiner rejected claims 1-7 and 11-13 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner stated, "Claim 1, the applicant's relationship of 'oscillating' and 'nutate' is confusing. According to Webster's Ninth New Collegiate Dictionary,

oscillating is defined as to swing backward and forward like a pendulum; to move or travel back and forth between two points; **nutate** is defined as the act of nodding; oscillatory movement of the axis of a rotating body; wobble.

Therefore, the phrase 'and at least one of driven and free to nutate' is awkward.

Claim 6 lines 2-3, 'whereby as to be pivotable' is grammatically awkward. Claim 6 is further confusing because it appears that the rock boring device is pivotable about an axis transverse the boom not **longitudinal**.

Claim 12 appears to be incorrect. Claim 12 calls for the rotary disc **velocity** is controlled by a computer program. However, the appears to be incorrect. Applicant is directed to page 6 where it appears that the **angle** of the rotary disc is controlled by the computer program."

Applicant has amended claims 1, 6 and 12. The phrase in Claim 1 which the Examiner referred to as awkward has been amended.

As provided for in the definitions given by the Examiner, oscillating movement or back and forth movement is that which primarily affects rock cutting. While this motion could be linear, for mechanical and practical operational reasons the oscillation is affected by an orbital motion of the cutting head. This allows the cutter to work in any planar direction. Nutation of cutting head is also as per the examiner's quoted definition. The cutting head is able to "wobble" as it oscillates. In other words, the disc cutter is free to rotate on a support axis offset from and at small angle to the axis of a driven shaft so that the disc is caused to simultaneously orbit about the driven axis and to nutate. The axis of the driven shaft is approximately normal to the rock face.

The disc cutter of the present invention is movable in two modes of motion, oscillating and nutating. An essential feature of the invention is that the cutter be driven (or powered) by the drive shaft in the oscillating mode. However, in the nutating mode, it is optional that the cutter be either driven to nutate or free (not driven) to nutate in accordance with the forces applied during operation of the cutter.

Claim 6 was amended so that the term "whereby as to be pivotable" was amended and now reads "such that said device is pivotable" which should be more grammatically correct. Further,

the device is pivotable on a number of axes. The support for this is found on page 13, lines 21-26. One of these axes is longitudinal boom axis Y from the drawings as well as an offset axis, axis W.

The velocity referred to in claim 12 is the linear velocity of the cutter. This is discussed in broad terms on page 12, lines 1-3. The speed of operation of the cutter would be understood by the relevant skilled person to be referring to the speed or velocity of the cutter during cutting.

Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 1-7 and 11-13 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner rejected claims 1-2 under 35 U.S.C. 102(b) as being anticipated by Bodine (US 4261425). To support the rejection the Examiner stated,

"Bodine discloses a rock boring device (see col. 1 line 6) including a rotary disc (see Fig. 5a-5d), the rotary disc is driven in an oscillating (see col. 1 line 37) and nutating manner (see col. 1 line 31). The device has a mounting section and a driven section, the mounting section is angularly offset from an axis of the driven section (see Fig. 3). Control of the speed of the rotary disc is taught (see col. 4 line 3)."

Applicant must disagree with the Examiner's interpretation of Bodine. The cited reference does not disclose a disc cutter

as does the present invention but discloses a cutter having conical drill bit cones. Bodine teaches "Drill bit cones are conventional roller cones in a bit assembly, such as commercially available from the Smith Tool Company, The Reed Tool Company, and the Hughes Tool Company." (Column 2, lines 11-14).

Clearly, the features as taught by Bodine are not the "disc cutter" of the present invention as defined in claim 1 and as described in the specification. As discussed in the background art section of the present application, the drill bit cone cutters use a compressive mechanism for cutting rock rather than the shearing mechanism of the present invention.

Moreover, it is noted that figures 5A to 5D appear to disclose a disc, however, study of the text indicates that the figures are merely a schematic representation of the nutating motion of the cutter shown in figures 1 and 2 (column 3, lines 14-15) and are not referring to a disc cutter per se.

In addition it is noted that the thrust of the cited document is toward nutation not oscillation. The two modes of motion are separable. The cited document uses an oscillator to affect nutating motion of the cutter head but does not specify that oscillation motion is a necessary mode of movement of the cutter head or even that it oscillates at all. In contrast, The present invention includes oscillating motion as an essential feature of the independent claim.

Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 1-2 under 35 U.S.C. 102(b) as being anticipated by Bodine (US 4261425).

Further in the office action the Examiner rejected claims 3-7 and 13 under 35 U.S.C. 103(a) as being unpatentable over Stoebe (US 6357831) in view of Bodine '425. The Examiner stated,

"Stoebe discloses a rock boring machine, a rock boring device is mounted on a boom, the boom can pivot about both a horizontal and vertical axis. The rock boring device is pivotable about a transverse axis to the boom. The rock boring machine is anchored (see Figs. 1,2).

Stoebe discloses the invention substantially as claimed. However, Stoebe's rock boring device is not a rotary disc that can oscillate and nutate. Bodine teaches an oscillating and nutating rotary disc (see col. I and Figs. 5a-5d). It would have been considered obvious to one of ordinary skill in the art to modify Stoebe by substituting the rock boring device as taught by Bodine for the rock boring device disclosed by Stoebe since it cuts more effectively (see Bodine reference col. 1 line 28+)."

Applicant has discussed previously that Bodine does not disclose an oscillating and nutating rotary disc as stated by the Examiner. The teaching of Bodine is not for a disc cutter but a cutter having conical drill bit cones. Further there is no teaching in Bodine that the oscillating motion is a necessary movement of the cutter head or that his cutter head even oscillates at all. Although Stroebe teaches a rock cutting

device mounted on a boom arm as in the present invention; however, as acknowledged by the Examiner, Strobe does not disclose an oscillating and nutating rotary disc cutter as does the present invention. Combining the teaching of Strobe with that of Bodine does not render the invention obvious since Bodine does not disclose the disc cutter of the present invention.

Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 3-7 and 13 under 35 U.S.C. 103(a) as being unpatentable over Stoebe (US 6357831) in view of Bodine '425.

The Examiner rejected claims 3 and 11 under 35 U.S.C. 103(a) as being unpatentable over Dubois (US 3663054) in view of Bodine '425. The Examiner stated,

"Dubois discloses a rock boring machine, a rock boring device is mounted on a boom, a plurality of rock boring devices are carried by the rock boring machine (see Fig. 1). Dubois discloses the invention substantially as claimed. However, Dubois's rock boring devices are not rotary discs that can oscillate and nutate. Bodine teaches an oscillating and nutating rotary disc (see col. I; and Figs. 5a-5d). It would have been considered obvious to one of ordinary skill in the art to modify Dubois by substituting the rock boring device as taught by Bodine for the rock boring devices disclosed by Dubois since it cuts more effectively (see Bodine reference col. 1 line 28+)."

As discussed previously in the rejection of claims 3-7 and 13 under 35 U.S.C. 103(a) as being unpatentable over Stoebe (US

6357831) in view of Bodine '425, Bodine does not disclose an oscillating and nutating rotary disc as stated by the Examiner. The teaching of Bodine is not for a disc cutter but a cutter having conical drill bit cones. Further, there is no teaching in Bodine that the oscillating motion is a necessary movement of the cutter head or that his cutter head even oscillates at all. Although Dubois teaches a rock cutting device mounted on a boom arm as in the present invention; however, as acknowledged by the Examiner, Dubois does not disclose an oscillating and nutating rotary disc cutter as does the present invention. Combining the teaching of Dubois with that of Bodine does not render the invention obvious since Bodine does not disclose the disc cutter of the present invention.

Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 3 and 11 under 35 U.S.C. 103(a) as being unpatentable over Dubois (US 3663054) in view of Bodine '425.

The Examiner then rejected claims 3 and 12 under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (US 6062650) in view of Bodine '425. The Examiner stated,

"Smith et al. discloses a rock boring machine, a rock boring device is mounted on a boom, the angle of the rock boring device is controlled by a computer program (see col. 9 line 10+). Smith et al. discloses the invention substantially as claimed. However, Smith et al. rock boring device is not a rotary disc that can oscillate and nutate. Bodine teaches an oscillating and nutating

rotary disc (see col. 1; and Figs. 5a-5d). It would have been considered obvious to one of ordinary skill in the art to modify Smith et al. by substituting the rock boring device as taught by Bodine for the rock boring device disclosed by Smith et al. since it cuts more effectively (see Bodine reference col. 1 line 28+)."

As discussed previously Bodine does not teach a disc cutter but teaches a cutter having conical drill bit cones and that, further, there is no teaching in Bodine that the oscillating motion is a necessary movement of the cutter head or that his cutter head even oscillates at all. Combining Smith with Bodine still does not teach the present invention. Smith teaches a rock cutting device on a boom, but neither Smith nor Bodine disclose the oscillating and nutating rotary disc cutter of the present invention.

Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 3 and 12 under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (US 6062650) in view of Bodine '425.

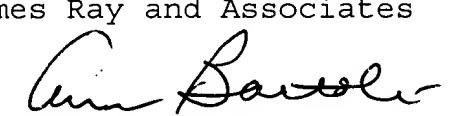
In view of the amendments to claims 1, 6 and 12 and the discussion supra, it is believed that the invention as described in claims 1-7 and 11-15 is patentable and that this application is now in condition for allowance and such allowance by the Examiner is respectfully requested.

In the event the Examiner has further difficulties with the examination and/or allowance of the application, the Examiner is invited to contact the undersigned agent for applicant by

telephone at (412) 380-0725, if necessary, to resolve any remaining questions or issues by interview and/or Examiner's Amendment as to any matter.

Respectfully submitted,
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By



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